DIFFUSION OF SUPPORTED PHOSPHOLIPID BILAYER MEMBRANES ON THE SURFACE OF B-ORIENTED MFI FILM WITH CONTROLLED SURFACE ROUGHNESS

PIOTR JURKIEWICZ, PAVEL JANDA, MILAN BOUSA, MARTIN HOF, MILAN KOCIRIK, IVAN JIRKA*

J. Heyrovsky Institute of Physical Chemistry, ASCR, Prague , 182 23, Czech Republic
Ivan.Jirka@jh-inst.cas.cz

Supported phospholipide bilayer membranes (SPBs) are extensively investigated as models of cell membranes [1]. The effect of interaction of SPB with support surface on SPB diffusion was often addressed. Variety of non-porous supports with smooth surfaces like mica, silica, etc. has been already used. Application of porous supports is rather rare (cf. [2] and references therein). The b-oriented MFI film grown on stainless steel (bMFI/SS) with controlled surface roughness is used in present study. The main advantage of this support is its simplicity. Moreover, further modification of the b-MFI/SS surface and interface region is rather straightforward, which enables tailoring the properties of the film surface in desired manner.
Mixed 1,2-palmitoyl-oleoyl-sn-glycero-3-phosphocholine (POPC) / 1,2-palmitoyl-oleoyl-sn-glycero-3-phosphoserine (POPS) (4:1 mol:mol) lipid vesicles labeled with Bodipy C12-HPC (2-(4,4-difluoro-5,7-dimethyl-4-bora-3a,4a-diazas-indacene-3-dodecanoyl)-1-hexadecanoyl-sn-glycero-3-phosphocholine) were deposited on b-MFI/SS. Creation of SPB was confirmed using fluorescence microscopy combined with fluorescence correlation spectroscopy (FCS). Using the synthesis according [3] with modified conditions and post-synthetic treatments the series of b-MFI/SS samples with various surface roughness was prepared. The zeolite support prepared by one step hydrothermal treatment is composed mainly from the monolayer of b-oriented overgrown crystals with small amounts of inserted a-oriented ones. The b-oriented zeolite surface with minimized concentration of the a-oriented MFI crystals exhibits roughness typically 50 nm. The overall support surface roughness is tuned by changing the concentration of the a-oriented surface crystals (a ~100 nm). The effect of thus introduced roughness of support surface on SPBs – b-MFI/SS film interaction is investigated using fluorescence. Diffusion of SPB measured with FCS was found to be affected by surface roughness of b-MFI/SS. SPBs lateral diffusion on surface with prevailing roughness of 50 nm was about two times faster (D = 3.5 m2/s) than the one on the surface with 100 nm roughness (D =2.4 m2/s).

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